

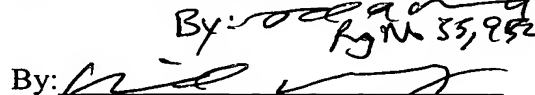
In accordance with 37 C.F.R. § 1.121(b)(3), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. § 1.121(b)(3)(iii) and § 1.125(b)(2), a Marked Up Version Of The Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) is respectfully requested.

The underlying PCT Application No. PCT/DE01/02669 includes an International Search Report, dated December 6, 2001. The Search Report includes a list of documents that were uncovered in the underlying PCT Application. A copy of the Search Report accompanies this Preliminary Amendment.

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,

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DEVICE FOR DETERMINING AT LEAST ONE PARAMETER
OF A FLOWING MEDIUM

Field Of The Invention

The present invention relates to a device for determining at least one parameter of a medium flowing in a duct.

5 Background Information

[The present invention is based on a device for determining at least one parameter of a medium flowing in a duct according to the preamble of Claim 1.

]German Patent Application No. 197 35 664 [A1] describes a device in which a plug sensor having a measuring element is situated within a pipe through which the medium flows, an upstream end of the pipe extending to a filter chamber. However, whirls are formed in the area of the incident-flow edge of the inner pipe, resulting in increased signal noise at the measuring element.

German Patent Application No. 196 52 753 [A1] describes a device having a measuring element, which contains a flow straightener for straightening the flow and a screen for stabilizing a measuring signal. However, no inner pipe is used in this device to protect the measuring element against the effect of dirt particles or water droplets.

20 Summary [of the] Of The Invention

The device according to the present invention [having the characterizing features of Claim 1] has the advantage compared to the related art that the pressure drop and signal noise are reduced in a simple manner.

[
25 Advantageous refinements of and improvements on the device named in Claim 1 are made possible by the measures given in the dependent claims.]

MARKED-UP VERSION OF SUBSTITUTE SPECIFICATION

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It is advantageous to situate a incident-flow edge of a barrel ring at approximately the same axial length as an external incident-flow edge of the inner pipe, since the barrel ring must only be extended in the axial direction.

5 [Drawing

An exemplary embodiment of the present invention is schematically illustrated in the drawing and explained in detail in the description that follows.] Brief Description Of The Drawings

10 Figure 1 shows an exemplary embodiment of a device designed according to the present invention[;].

Figure 2 shows an axial cross-section of Figure 1.

Detailed Description [of the Exemplary Embodiment]

15 Figure 1 shows a device 1 designed according to the present invention in front view. Device 1 includes a duct 5, into which a plug sensor 3 may be inserted, for example. A medium flows in duct 5 in the flow direction 7, i.e., in a direction which is perpendicular to the plane of the drawing. A flow straightener (stabilizer) 9, secured in duct 5, is situated upstream from plug sensor 3, for example. A barrel ring 13, for
20 example, a short pipe element, used to secure an inner pipe 17, is connected to flow straightener 9, for example. Barrel ring 13 has at least one brace 15, which connects barrel ring 13 to inner pipe 17 or a diverting screen 19, securing inner pipe 17 in flow straightener 9 or in duct 5. Inlet (inflow) opening 21 area of inner pipe 17 has
25 diverting screen 19, for example. Diverting screen 19 is used to reduce the effect of foreign particles such as liquid or solid particles, for example, on measuring element 33 situated downstream (Fig. 2). The design of such a measuring element 33 is sufficiently known to those skilled in the art, for example, from German Patent Application [195 24 634 A1, whose disclosure is an integral part of the present
30 Patent Application] No. 195 24 634, disclosure of which is hereby expressly incorporated by reference herein.

Figure 2 shows an axial cross section of device 1 of Figure 1.

Inner pipe 17 has a central axis 18. The top of Figure 2 (part of inner pipe 17 between central axis 18 and plug sensor 3) shows the related art without element 11 and the bottom of Figure 2 shows the embodiment according to the present invention having element 11.

At the periphery of its end face 23, inner pipe 17 forms an outer incident-flow edge 25, around which the medium flows. Barrel ring 13 has an inner incident-flow edge 27.

In this embodiment, flow straightener 9 is situated downstream from inlet opening 21. Therefore, in the area of incident-flow edge 25, whirls 29 are formed according to the related art, as a flow line 31 indicates in Figure 2. This results in increased signal noise at measuring element 33 and a higher pressure drop in duct 5 and inner pipe 17.

An element 11 is situated in the proximity of the outer incident-flow edge 25 of inner pipe 17, for example, on inner pipe 17, and reduces the whirl formation in the flowing medium. This may take place, for example, by applying an additional streamline-shaped elevation on inner pipe 17, which accelerates the flowing medium.

If incident-flow edge 27 of barrel ring 13 is approximately at the same axial height as outer incident-flow edge 25 of inner pipe 17, these whirls 29 are also no longer formed, since the area of passage for the flow in duct 5 is reduced at approximately the axial height of inlet opening 21 and the flowing medium is accelerated, whereby the whirl formation or the number of whirls formed is reduced. Depending on the flow conditions, whirls rotating in the opposite direction may also be formed, compensating the other, interfering, whirls according to the related art. With this

design of barrel ring 13, element 11 is formed in order to reduce the whirl formation.

Thus, the flow in and around inner pipe 17 is stabilized, and the signal noise at measuring element 33 and the pressure drop are reduced.

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Measuring element 33, which determines at least one parameter of a flowing medium, is situated within plug sensor 3. Parameters of a flowing medium include the air volume flow rate (volumetric flow) for determining an air mass, a temperature, a pressure, a concentration of a medium component, or a flow velocity, which are

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determined using appropriate sensors. Device 1 can be used for determining further parameters. This can be accomplished by using two or more sensors, one sensor being capable of determining two or more parameters.

Abstract Of The Disclosure

Devices for determining at least one parameter of a flowing medium having an inner pipe according to the related art have the disadvantage that whirls are formed, which causes increased signal noise at the measuring element and pressure drop. [A

5 device [(1)] is described which has an element [(11)] that reduces the whirl formation in the flowing medium.